Space Weather Forecast

Issued on Saturday 4 January 2025 at 13:06 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Moderate class flares likely, with an increased chance of Strong class flares. Chance G1 Minor Geomagnetic Storms Days 1-2 (04-05 Jan).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity increased to High levels with a Strong flare observed at 03/2241UTC, both flares from sunspot AR3947 in the northeast disk. This region also looks responsible for two Moderate flares in the past 24 hours.

There are fifteen sunspot regions on the Earth-facing disc, with three unnumbered regions. Despite the large number of spots on the Earth facing-disc, many are small and generally magnetically simple. A complex spot in the northeast is the largest spot and has been responsible for the bulk of recent activity, with two lower X-class flares now recorded since appearing over the eastern limb. Another spot in the centre-east shows some magnetic complexity and has seen some growth in its intermediate spots in recent hours. Some slight decay of AR3939 and AR3945 has taken place, otherwise there has been little change to the remaining regions on the Earth facing-disc.

The Coronal Mass Ejection (CME) associated with the Strong flare observed at 03/2241 UTC has been assessed as non-Earth directed.

Solar Wind / Geomagnetic Activity: Solar winds showed a generally steady decline from 460km/s towards 400km/s the first half of the period, but then following the suspected CME (coronal mass ejection) impact at around 04/0200UTC oscillated between slightly elevated and elevated levels of 450-550km/s for the rest of the period. The Interplanetary Magnetic Field, Bt, was largely moderate, but became strong from around 04/0730 UTC. The north-south component, Bz, was moderately positive through much of the period, but became moderately negative between around 04/0330-0900 UTC.

Geomagnetic activity was at Quiet levels until 04/0300 UTC. Then became mostly Active for the remainder of the period, with G1/Minor geomagnetic storm conditions recorded between 04/0600-0900UTC.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remained at background levels with no Solar Radiation Storms observed.

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Met Office

Space Weather Forecast

Four-Day Space Weather Forecast Summary

Solar Activity: Activity is forecast to be Moderate to High, with isolated Moderate flares considered likely and a chance of further isolated strong flares. This risk increased given recent activity from the complex region in the northeast.

Solar Wind / Geomagnetic Activity: A CME associated with the weak filament eruption on 01 Jan from the vicinity of AR3939 arrived at L1 around 04/0225 UTC. A large coronal hole is expected to bring an onset of faster solar winds during the later half of Day 1 (04 Jan) or into Day 2 (05 Jan). Elevated solar winds of 500-600km/s are likely, declining only slowly into Days 3 and 4 (06-07 Jan).

Geomagnetic conditions are expected to be Unsettled to active through Days 1-2, with a chance of G1 Minor geomagnetic storm intervals. Initially this is due to ongoing CME effects, but later this is attributed to the expected HSS onset during the later half of Day 1 or into Day 2. Activity is forecast to subside to generally Quiet to Unsettled levels into Days 3 and 4.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is likely to continue at background levels, but with a slight chance of exceeding the S1/Minor Storm threshold.

Geomagnetic Storms

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	30	30	10	1
Strong	G3	No	2	2	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X-Ray Flares

X-Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 (M Class)	Yes	70	70	70	70
Very Active	R3-R5 (X Class)	Yes	25	25	25	25

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Solar Radiation Storms (High Energy Protons)

Radiation Storms Probability (Exceedance)	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	10	10	10	10
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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